



# National Institute of Standards & Technology

## Certificate of Analysis

Standard Reference Material<sup>®</sup> 3199

Aqueous Electrolytic Conductivity

Lot No. 043001

This Standard Reference Material (SRM) is intended primarily for use in electrolytic conductivity measurement as a calibration standard or control sample. As a calibration standard, it can be used to determine the conductivity cell constant. One unit of SRM 3199 consists of one 500-milliliter bottle filled with a solution of dilute potassium chloride (KCl) in a mixture of 30 % (by mass) n-propanol, 70 % (by mass) deionized water in equilibrium with atmospheric carbon dioxide.

SRM 3199 was prepared gravimetrically using deionized water that was filtered through a 0.22  $\mu\text{m}$  filter. The initial electrolytic conductivity of this water was less than 0.2  $\mu\text{S}/\text{cm}$ . The n-propanol was purchased commercially and assayed by the manufacturer at 100 %. The solution was dispensed into borosilicate glass (Pyrex 33<sup>®</sup>)<sup>1</sup> bottles. The certified electrolytic conductivity and its uncertainty given below were established through determinations with a conductivity cell immersed in a constant temperature oil bath and using a Jones bridge with a null detector. The conductivity bridge and electronics are described in reference [1].

The certified value given below is based on equilibrium conditions, and the solution should **NOT** be degassed before use.

Electrolytic Conductivity at 25.000 °C: 14.83  $\mu\text{S}/\text{cm}$   $\pm$  0.37  $\mu\text{S}/\text{cm}$

The uncertainty in the certified value,  $U = 0.37 \mu\text{S}/\text{cm}$ , is calculated as

$$U = 2.0u_c$$

where  $u_c$  is the *combined standard uncertainty* calculated according to the ISO/NIST Guides [2]. The value of  $u_c$  is intended to represent, at the level of one standard deviation, the combined effect of the major uncertainty components associated with instability of the SRM and carbon dioxide dissolution. The value of  $u_c$  has been multiplied by 2.0, which is the coverage factor corresponding to approximately 95 % confidence based on greater than 1000 overall effective degrees of freedom.

**Expiration of Certification:** The certification of **SRM 3199 Lot No. 043001** is valid, within the measurement uncertainty specified, until **30 January 2005**, provided the SRM is handled in accordance with instructions given in this certificate (see "Instructions for Use"). This certification is nullified if the SRM is damaged, contaminated, or otherwise modified.

This SRM was prepared and analyzed by R.H. Shreiner of the NIST Analytical Chemistry Division.

Willie E. May, Chief  
Analytical Chemistry Division

Gaithersburg, MD 20899  
Certificate Issue Date: 17 March 2004

John Rumble, Jr., Chief  
Measurement Services Division

---

<sup>1</sup>Certain commercial equipment, instruments, or materials are identified in this certificate in order to specify adequately the experimental procedure. Such identification does not imply recommendation or endorsement by the National Institute of Standards and Technology, nor does it imply that the materials or equipment identified are necessarily the best available for the purpose.

Statistical consultation was provided by W.F. Guthrie of the NIST Statistical Engineering Division.

The support aspects involved with issuance of this SRM were coordinated through the NIST Standard Reference Materials Program by C.S. Davis of the NIST Measurement Services Division.

**Maintenance of Certification:** NIST will monitor representative solutions from this SRM lot over the period of its certification. If substantive changes occur that affect the certification before the expiration of certification, NIST will notify the purchaser. Registration (see attached sheet) will facilitate notification.

Conductivity is strongly influenced by temperature, and for this solution, the temperature coefficient at 25 °C is approximately 2.9 % per °C [3]. The certified value and its uncertainty were determined with the temperature at 25.000 °C  $\pm$  0.002 °C.

## INSTRUCTIONS FOR USE

The SRM bottle should be open for the minimum time required to dispense the solution. Each time the bottle is opened, a portion of the solution will evaporate, which will change the conductivity. After use, the bottle should be tightly recapped and stored under normal laboratory conditions, away from acid fumes, nitrogen oxides, and sulfur dioxide. These precautions will reduce the evaporation rate of the solution and possible acidic contamination.

## REFERENCES

- [1] Jameel, R.H.; Wu, Y.C.; Pratt, K.W.; *Primary Standards and Standard Reference Materials for Electrolytic Conductivity*; NIST Special Publication 260-142; U.S. Government Printing Office: Washington, DC (2000).
- [2] *Guide to the Expression of Uncertainty in Measurement*; ISBN 92-67-10188-9, 1st ed.; ISO: Geneva, Switzerland (1993); see also Taylor, B.N.; Kuyatt, C.E.; *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*; NIST Technical Note 1297; U.S. Government Printing Office: Washington, DC (1994); available at <http://physics.nist.gov/Pubs/>.
- [3] Wu, Y. C.; Pratt, K.W.; Koch, W.F.; *Determination of the Absolute Specific Conductance of Primary Standard KCl Solutions*; J. Solution Chem., Vol. 18, p. 515 (1989).

*Users of this SRM should ensure that the certificate in their possession is current. This can be accomplished by contacting the SRM Program at: telephone (301) 975-6776; fax (301) 926-4751; e-mail [srminfo@nist.gov](mailto:srminfo@nist.gov); or via the Internet at <http://www.nist.gov/srm>.*